

## REMARKS

Claims 11, 12, 18, 22 and 27-30 are currently pending in the application. By this amendment, claims 11 and 23 are amended and new claims 27-30 are added for the Examiner's consideration. The foregoing separate sheets marked as "Listing of Claims" show all the claims in the application, with an indication of the current status of each.

### **Claim Rejections: 35 USC § 103(a)**

Claim 12 stands rejected under 35 USC § 103(a) as obvious over German patent specification DE 19826780. This rejection is traversed.

Examiner states that the reference teaches, in the abstract, a flame retardant comprising a mixture of A) silicic acid and B) ammonium and/or alkali metal carbonate material having a volume median particle size of 1-40, preferably 2-15 microns. Applicant submits that this reference is irrelevant. The reference teaches the use of silicic acid. Silicic acid is a general name of a family of chemical compounds of the elements silicon, hydrogen and oxygen having a general formula  $[SiO_x(OH)_{4-2x}]_n$  (see attached printout). In contrast, the only silica compounds suggested for use in the present invention are SiO<sub>2</sub> and SiC (see paragraph [0018] of the published application. Thus, DE 19826780 does not render obvious the present invention, as it does not teach or describe the use of silicon compounds other than silicic acids.

In view of the foregoing, Applicant respectfully requests reconsideration and withdrawal of this rejection.

### **Claim Rejections: 35 USC § 103(a)**

Claim 22 stands rejected under 35 USC § 103(a) as obvious over United States patent 5,817,369 to Conradie et al. (hereinafter "Conradie"). This rejection is traversed.

Conradie provides compositions used to impregnate wood, "impregnate" in this case meaning "to incorporate a chemical into a porous material such as wood or cloth, especially by soaking it thoroughly with a liquid" (see attached printout). Conradie's composition is formulated especially to insure that the solution actually impregnates the wood, i.e. is absorbed by or diffuses into the wood. Thus, the composition is required to be a supersaturated solution of an inorganic solute in an aqueous solvent made by mixing an aqueous solvent and salt solute together with an organic dopant comprising an emulsifier and an oil or wax (see abstract and Claim 1). The goal of Conradie's invention is to achieve complete penetration by the solution into the interior of the wood (see paragraph at lines 31-34 of column 7 and lines 10-13 of column 4).

The production of a composition that can be absorbed or diffused into the interior of wood is irrelevant to the present invention. Applicant submits that one of ordinary skill in the art would not be motivated to remove the requirements of Conradie (e.g. supersaturation of the solution, presence of an emulsifier, etc.), as this would render the invention inoperable. In contrast, the compositions of the present invention are formulated to be applied to the surface of an object (which may be wood) to form a layer or coating of flame retardant protection, not to be absorbed into the object. Claim 22 recites that "...a volume of a layer formed by the fire-protection agent...", and the application states that the composition of the present invention forms an insulating layer or fire-protection coat (see paragraphs [0022]-[0023] of the published application). Inclusion of the features taught by Conradie in the compositions of the present invention would defeat the purpose of the invention (i.e. render it inoperable), which is to provide a protective layer of a fire-protecting agent, preferably that is transparent and scratch resistance and abrasion resistance (paragraph [0015] of the published application). Likewise, the compositions of the present invention would not be suitable for use in the invention of Conradie, as they are not formulated to penetrate into the interior of wood. Conradie thus does not supply any description, teaching or motivation for the compositions and methods of the present invention and thus does not render the present invention obvious.

In view of the foregoing, Applicant respectfully requests reconsideration and withdrawal of this rejection.

**Claim Rejections: 35 USC § 103(a)**

Claims 11 and 18 stand rejected under 35 USC § 103(a) as obvious over European patent specification 878520. This rejection is traversed.

878520 teaches compositions for flame and fire protection in the very high temperature range, e.g. 2000 K (1725 °C). Thus, these formulation would be totally unsuitable for use to protect substances such as wood or other building materials. Rather, the compositions of 878520 are suited instead for protecting metal and ceramic part exposed to e.g. hot gases. Paragraph 5 of the machine translation states this and criticizes prior art flame retardants which protect only textiles, buildings, etc. at lower temperatures, thus teaching away from the present invention by showing the inadequacy of such formulations. The formulations of the present invention, in contrast, are regulable temperature range of preferably from 110 to 220 °C (see paragraph [0048] of the published application]. In addition, 878520 does not provide any teaching of adding "volume formers" to the

composition. Examiner refers to claim 3 ostensibly as listing “volume formers”. However, based on 878520, there is no reason for Examiner to state that they are “volume formers”. The compounds listed in claim 3 of 878520 are “low melting polyphosphates selected from alkali, alkaline-earth, silicon and ammonium polyphosphate”. Alkali metals include Li, Na, K, Rb, Cs and Fr and alkaline earth metals include Be, Mg, Ca, Sr, Ba and Ra. No polyphosphates of any of these are suggested for use in the present invention (see paragraph [0019] of the published application). In addition, no silicon polyphosphates are taught as volume formers in the present application. Finally, ammonium polyphosphate is taught only in a coated form (melamine-coated ammonium polyphosphate). Thus, there is absolutely no overlap whatsoever between the optional second ingredient of the compositions of 878520 and the required “volume former” of the present invention. Therefore, the compositions of the present invention, which require both ceramic-forming additives and volume forming fire-protection agents are not rendered obvious by 878520.

In addition, there is no discussion in 878520 of nano-coated salts, required in claims 11 and 18. Examiner’s mere statement that “it is *believed* that this intimate association of the materials would result in the extremely small particle size” is insufficient to warrant the present grounds of rejection. There is no showing or demonstration in 878520 that this is the case, and mere conjecture by the Examiner is not sufficient to replace proof supplied by the teachings of a reference. There is thus no teaching or description in 878520 that renders the present invention, as claimed in claims 11 and 18, obvious.

In view of the foregoing, Applicant respectfully requests reconsideration and withdrawal of this rejection.

**Claim Rejections: 35 USC § 103(a): GB 2272444A**

Claim 12 stands rejected under 35 USC § 103(a) as obvious over UK patent specification GB 2272444A. This rejection is traversed.

A review of the subject matter of GB 2272444A reveals that this reference does not teach any ceramic forming additives such as those taught in paragraph [0018] of the present application, and which are required to be present in the composition of claim 12. Rather, GB 2272444A teaches only volume forming additives without any suggestions of using ceramic-forming additives. Therefore, this reference does not render obvious the subject matter of claim 12.

Applicant notes that in summarizing the features of GB 2272444A Examiner has eviscerated the invention, which actually requires the presence of “a homopolymer or

copolymer" comprising a "linear backbone formed of at least 10 repeat units and contain a plurality of basic nitrogen functionalities" (claim 1). The use of a reference in an obviousness rejection should not render the invention described in the reference inoperable.

In view of the foregoing, Applicant respectfully requests reconsideration and withdrawal of this rejection.

**Claim Rejections: 35 USC § 103(a): GB 2272444A and Japanese specification JP04-249550A**

Claims 11 and 18 stand rejected under 35 USC § 103(a) as obvious over UK patent specification GB 2272444A in view of Japanese specification JP04-249550A. This rejection is traversed.

The inadequacy of GB 2272444A as a prior art reference has been discussed above. Briefly, this reference does not teach ceramic forming additives such as those taught in the present application, and required to be present in the composition of claims 11 and 18. GB 2272444A teaches only volume forming additives, with, as stated by the Examiner, absolutely no suggestion or teaching of a nanoparticle coating. The secondary reference (JP04-249550A) ostensibly supplies this teaching. However, based on the abstract that was provided, this reference teaches only single composition particles (aluminum hydroxide, zirconium hydroxide, or barium metaborate). None of these agents are taught in the present invention as either ceramic- or volume-forming agents and such teaching is not provided or suggested in either reference. Contrary to Examiner's assertion, the described compositions are not identical to those claimed in claims 11 and 18.

Neither GB 2272444A or JP04-249550A provides a suggestion or teaching of the compositions claimed in claims 11 and 18. Therefore, no combination of these references render obvious the subject matter of claims 11 and 18.

In view of the foregoing, Applicant respectfully requests reconsideration and withdrawal of this rejection.

**New claims**

New claims 27-30 recite the embodiment of the invention in which at least two ceramic-forming additives are present in the composition. Support for these claims is found in the specification, for example, in paragraph [0018] of the published application. The new claims thus do not add any new matter, and Applicant respectfully requests entry, consideration and allowance of these new claims.

### Examples

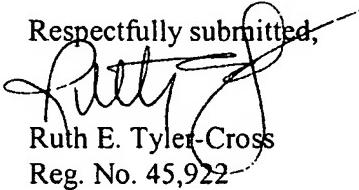
Applicant herewith submits for Examiner's consideration, examples provided by the inventors and attached hereto. The examples comprise experiments with the state of the art flame retardant composition pyroplast HW containing a volume former and two experiments with a composition according to the present invention containing a volume former and, in addition, ad ceramic forming additive. As clearly demonstrated in the example, the composition according to the present invention displays superior properties with respect to the retardant against heat. That is, while the critical temperature of 270 °C of the wood surface was reached already after 13.5 min using the pyroplast HW coating, the coating of a composition according to the present invention allows resisting the critical temperature 34.5 min. That is, the critical temperature of 270 °C is reached only after 34.5 min when coated with a thickness of 2 mm and 28 minutes with a coating of 1.5 mm dry thickness is applied.

These examples demonstrate that, prior to the present invention, there was a need in the art to provide flame retardant compositions with greater efficacy than any that had been heretofore provided.

### Concluding Remarks

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

A provisional petition is hereby made for any extension of time necessary for the continued pendency during the life of this application. Please charge any fees for such provisional petition and any deficiencies in fees and credit any overpayment of fees to Attorney's Deposit Account No. 50-2041.

Respectfully submitted,  
  
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# -EXAMPLES-

To prove the performance of the developed formulations furnace tests were carried out. As a state of the art system a market available fire retardant coating for wood was used. The brand name was Pyroplast HW. Pyroplast HW is a water-based dispersion for interior applications. The Pyroplast coating contains a volume former.

The formulation S11 used to prove the performance is given in the two tables below:

Table 1: Formulation of part A

Gew. %:	component:
27,1	MF-resin 1
8,1	MF-resin 2
4,1	PF-resin 1
4,1	flame retardant
13,6	PF-resin 2
29,3	solvent
0,4	defoamer
0,4	flow control additives
1,0	solvent
9,6	additives
1,0	frame building agent
0,5	hydrophobing agent
	N,N'-Bisstearylidenediamine micronised

Table 2: Formulation of part B

Gew. %:	component
58,6	phosphoric acid ester
7	solvent
0,6	defoamer
0,4	catalyst
0,6	flow control additive
19,3	APP
2,4	glass former
6,9	solvent
	partial phosphoric acid ester
	water
	modified Polydimethylsiloxane
	amin salt of paratoluenesulfonic acid
	modified polyacrylate
	Ammoniumpentaborate
	Xylen

## Testlayout

Fire tests were carried out according to EN 1363 in furnaces. The heating regime in the furnace was the standard temperature time curve (ETK) given in ISO 834 as follows.

$$T = 345 \log_{10} (8t+1) + 20$$

where T is the average furnace temperature in °C and t is the time in minutes.

The tested samples were 25 cm long spruce joist coated with the different formulation. Temperature sensors were arranged directly below the coating layer on three sides of the joist. As a criteria a critical temperature of 270°C of the wooden surface was defined according to DIN EN 13501-2.

The sensor cables were placed in milled slots. After the application of the coating the samples were sealed in porous stones to avoid end grain effects.

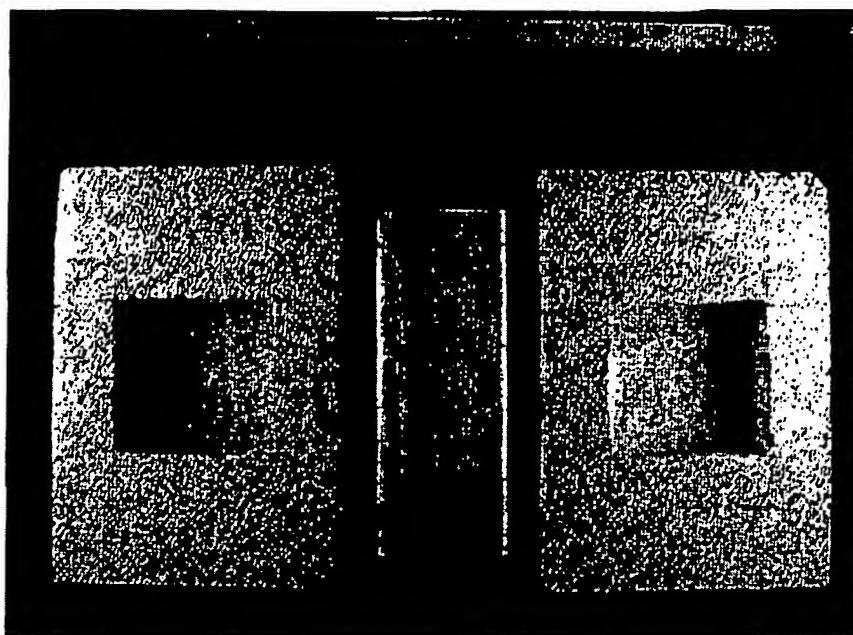


Figure 1 Principle of the joist samples (without temperature sensors)

## Results

### Pyroplast HW 2mm

Pyroplast HW was tested with a dry coating thickness of 2 mm. The following figure shows the temperature of the three thermo sensors. The critical temperature of 270°C is reached app. after 13.5 minutes.

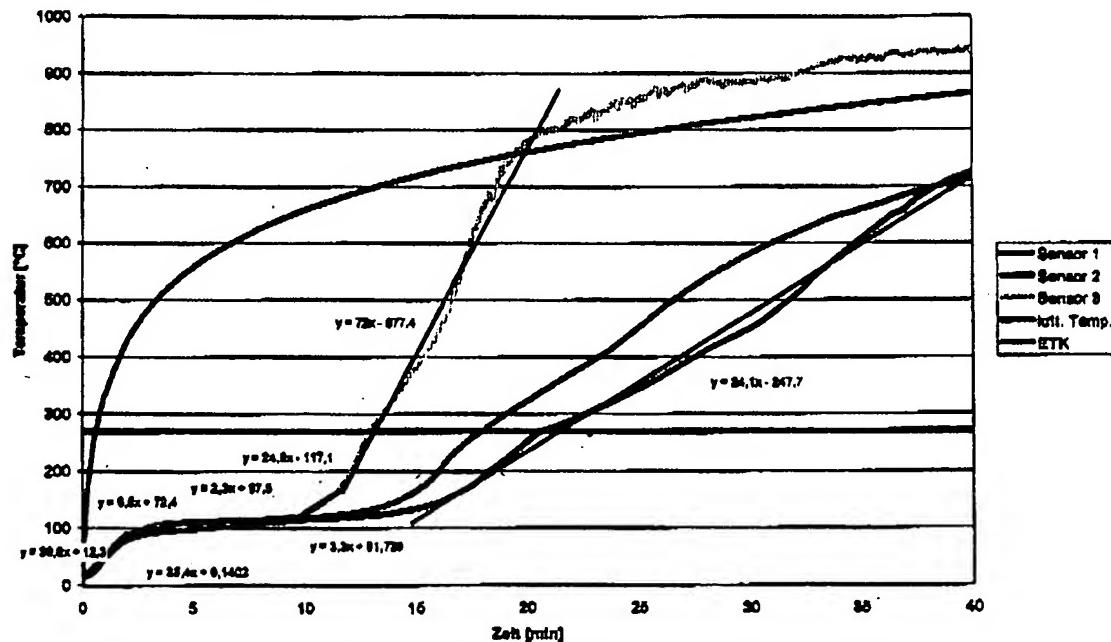


Figure 1: Temperature time graph of a fire test. The fast rising curve describes the oven temperature (standardized temperature-time curve). The three other curves display the temperature taken at the boundary between wood and protective coating-Pyroplast HW 2mm

### S11 2mm

S 11 was tested with a dry coating thickness of 2 mm. The critical temperature is reached after app. 34.5 minutes.

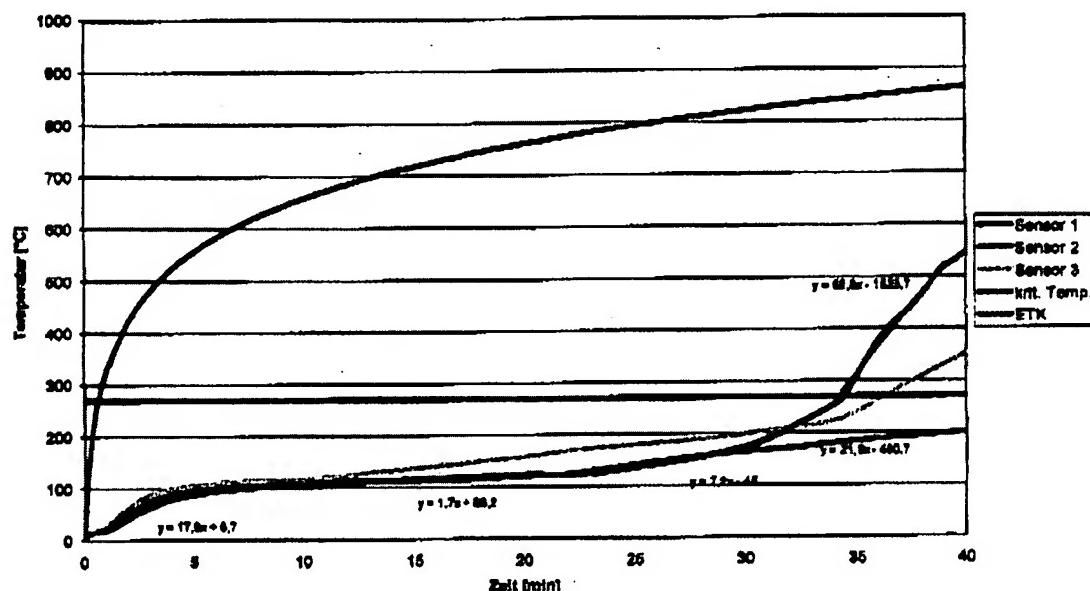


Figure 3: Temperature time graph of a fire test. The fast rising curve describes the oven temperature (standardized temperature-time curve). The three other curves display the temperature taken at the boundary between wood and protective coating—S 11 (2 mm)

### S11 1.5 mm

Another test was performed to secure the results. In this test the dry coating thickness was 1.5 mm. The test layout was changed slightly. In the test three additional thermo sensors were applied to the sample.

The critical temperature is reached after app. 28 minutes.

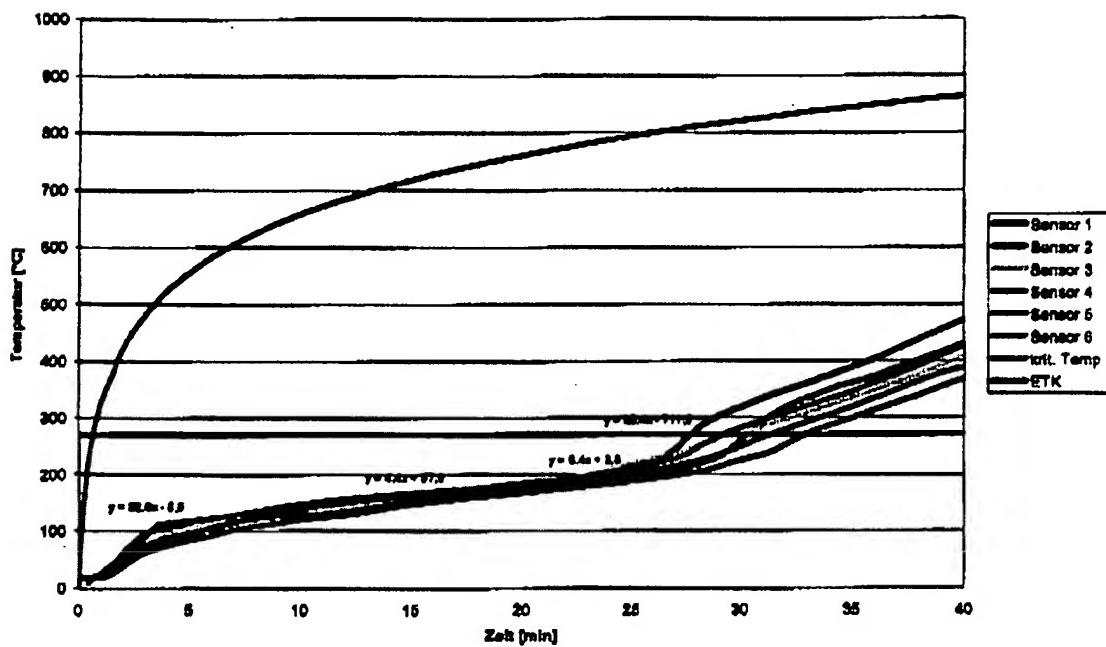


Figure 4: Temperature time graph of a fire test. The fast rising curve describes the oven temperature (standardized temperature-time curve). The three other curves display the temperature taken at the boundary between wood and protective coating—S 11 1.5 mm

# Silicic acid

From Wikipedia, the free encyclopedia

**Silicic acid** is a general name for a family of chemical compounds of the element silicon, hydrogen, and oxygen, with the general formula  $[SiO_x(OH)_{4-2x}]_n$ .<sup>[1][2]</sup> Some simple silicic acids have been identified in very dilute aqueous solution, such as *metasilicic acid* ( $H_2SiO_3$ ), *orthosilicic acid* ( $H_4SiO_4$ ,  $pK_{a1}=9.84$ ,  $pK_{a2}=13.2$  at  $25^\circ C$ ), *disilicic acid* ( $H_2Si_2O_5$ ), and *pyrosilicic acid* ( $H_6Si_2O_7$ ); however in the solid state these probably condense to form polymeric silicic acids of complex structure.

Silicic acids may be formed by acidification of silicate salts (such as sodium silicate) in aqueous solution. When heated they lose water to form silica gel, an active form of silicon dioxide.

In the oceans, silicon exists primarily as orthosilicic acid ( $H_4SiO_4$ ), and its biogeochemical cycle is regulated by the group of algae known as the diatoms. These algae polymerise the silicic acid to so-called biogenic silica, used to construct their cell walls (called frustules).

Continuing research of the correlation of aluminium and Alzheimer's disease has in the last few years included the use of silicic acid in beverages<sup>[3][4][5]</sup>, due to its abilities to both reduce aluminium uptake in the digestive system as well as cause renal excretion of aluminium.

Orthosilicic acid is the form predominantly absorbed by humans and is found in numerous tissues including bone, tendons, aorta, liver and kidney. Compelling data suggest that silica is essential for health although no RDI has been established. However, deficiency induces deformities in skull and peripheral bones, poorly formed joints, reduced contents of cartilage, collagen, and disruption of mineral balance in the femur and vertebrae.<sup>[6]</sup>

Choline-stabilized orthosilicic acid is bioavailable nutritional supplement. It has been shown to stimulate collagen type I synthesis and osteoblastic differentiation in human osteoblast-like cells in vitro<sup>[7]</sup>, improve hair tensile strength<sup>[8]</sup>, have positive effect on skin surface and skin mechanical properties, and on brittleness of hair and nails<sup>[9]</sup>, abate brittle nail syndrome<sup>[10]</sup>, partially prevent femoral bone loss in the aged ovariectomized rat model<sup>[11]</sup>, increase collagen concentration in calves<sup>[12]</sup>, and have potential beneficial effect on bone collagen formation in osteopenic females<sup>[13]</sup>.

## References

1. ^ N. N. Greenwood, A. Earnshaw, *Chemistry of the Elements*, 2nd ed., Butterworth-Heinemann, Oxford, UK, 1997.
2. ^ R. K. Iler, *The Chemistry of Silica*, Wiley, New York, 1979.
3. ^ Exley C, Korczakina O, Job D, Strekopytov S, Polwart A, Crome P (2006). "Non-invasive therapy to reduce the body burden of aluminium in Alzheimer's disease". *J. Alzheimers Dis.* 10 (1): 17–24; discussion 29–31. PMID 16988476 (<http://www.ncbi.nlm.nih.gov/pubmed/16988476>).



Annual mean sea surface silicic acid for the World Ocean. Data from the World Ocean Atlas 2005 (<http://www.nodc.noaa.gov/OC5/WOA05/>).

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## Dictionary

Find impregnate in Dictionary

Dictionary Thesaurus Translations

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

impregnate

im·preg·nate [ im prég nāyt ]

transitive verb (*past and past participle*  
*im·preg·nat·ed, present participle*  
*im·preg·nat·ing, 3rd person present singular*  
*im·preg·nates*)

**Definition:**

**1. saturate material:** to incorporate a chemical into a porous material such as wood or cloth, especially by soaking it thoroughly with a liquid (*usually passive*)

**2. permeate something with quality:** to permeate something with a particular aura or tone, or make something contain a particular quality (*literary*)  
 • *This was a major speech impregnated with references to the Constitution and its interpretation.*

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